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LINKING COMPETITIVENESS CLUSTERS WITH PUBLIC HIGHER EDUCATION AND RESEARCH: THE FRENCH PUZZLE[1]

Philippe LEFEBVRE, Frédérique PALLEZ, Daniel FIXARI

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Abstract

The importance of proximity in the field of innovation has been highlighted, notably, in studies which emphasize the growing role of the third mission of the universities, namely, regional economic development. Using an empirical approach, we have attempted to gain an insight into the ways in which networks involving local economic and academic actors are created. This study focuses on France, where the State has recently promoted an aggressive policy designed to develop clusters and reform higher education and research, with a view to bringing together universities, creating centres of excellence, research networks at the local level and promoting connections of both to clusters. The study reveals the existence of a wide variety of configurations and, in spite of globally positive dynamics, highlights areas in which insufficiently well coordinated governmental approaches could be improved. The study also underlines a number of hitherto neglected aspects: a less global approach to institutions should be taken, and analyses of the variety of possible links between science and innovation should be more nuanced. Lastly, the study highlights a profound transformation in the approaches taken by governmental agencies.

Key words

Clusters -Territories- Regional studies-Universities- Science and Innovation- Public policy

[1] A first draft of this paper was presented at the "*Colloque International Regional Competitiveness Clusters and Economic Development*", HEC Management School - 2 et 3 mars 2009-Liège

Introduction

In a knowledge economy, access to pertinent knowledge, and the kinds of networks in which actors operate are increasingly critical factors, a fact underlined both by statistics concerning joint R&D projects (Hagedoorn 1996), by the success of approaches framed within the terms of "Innovation Systems", whether they be national or regional, and, more recently, "open innovation" (Christensen 2005; Chesbrough 2006). Open innovation, based on networks, can operate globally or locally, regionally or on a worldwide level. But, while routine activities can be more easily carried out on geographically separate sites (Berger 2006), the importance of proximity in innovation has often been underlined.

But how, concretely, do these networks of academic and economic actors function? We fortunately had the opportunity of carrying out an empirical study in France on this subject, whose results highlights this question. This will be the subject of this paper.

After rehearsing the theoretical background and the context characterising public policies linking industry, higher education and research in Part 1, we will examine, in Part 2, French policy regarding clusters and the evolution of the Higher Education and Research System and outline the methodology of the empirical study used to see how these policies are articulated at the regional level.

In Part 3 we outline the results of our empirical study, which was carried out at the request of a state agency, and examine the wide variety of regional configurations. We also pose questions concerning the efficiency of the kind of policies currently being applied.

In Part 4, we question state involvement in regulating relations between actors, the efficiency and durability of the system and suggest a number of approaches to reinforcing rather than reducing that variety and supporting the dynamic of the system.

In Part 5, in conclusion, we discuss the empirical results of our study and isolate a number of aspects that have been insufficiently taken into account in the literature. We contend that models should be extended to include not merely regions and states, but also clusters, and provide an outline of the deep intrinsic changes required, notably at the governmental level, to trigger positive, long-lasting dynamics.

1. Theoretical background of public policies linking academe and industry

Etzkowitz and Leydesdorff (Etzkowitz and Leydesdorff 1995; Etzkowitz and Leydesdorff 1997) have elaborated three configurations defining State-University-Industry relations. According to the authors, these relations succeed each other chronologically:

- The first type corresponds to a model in which the Nation-State encompasses academe and industry and directs relations between them.
- The second type refers to a model in which the State plays a less predominant role and in which each one of the institutional spheres has clearly defined borders and circumscribed relations with the others.
- The third type represents a model of development and innovation in which the three spheres, all of which are in perpetual evolution, interact flexibly on different territorial levels in complex ways. This model, known as the "Triple Helix", is gradually becoming the normative theoretical structure framing a certain number of public policies, notably in Europe.

Even though, in Europe, approaches to the implementation of the Triple Helix model seem to share a common framework, the structures employed, the organisations concerned, the nature of the collaborations observed, and the dynamics of the innovation systems resulting from those configurations, are relatively contrasted.

For over twenty years now, a large number of European countries and regions have been promoting policies which encourage private sector companies to become involved in research and higher education. Cluster policies have played an important role in this trend (Anderson and al. 2004). Under the aegis of national and/or regional authorities, cluster policies – for example the "Competence Centres" of northern Europe (Denmark, Sweden) introduced in 1990, the German Kompetenznetze introduced in 1998, and, more recently, the French "Pôles de Compétitivité" (2005) – have aimed to unite private sector companies, research centres, and higher education establishments with a view to encouraging innovation by means of the development of collaborative R&D projects.

While various countries and regions are promoting the cluster policies outlined above, other policies, the objective of which is to reform higher education and research systems, are also being introduced.

As a number of specialists in the field of higher education have observed (Etzkowitz 1998; Etzkowitz H., Webster A. et al. 2000; Ramirez 2008), there is a widespread belief in the existence of a quantitative link between the quality of education in a given country and that country's economic growth rate. However, no unanswerable proof of such an assertion has ever been produced. The belief leads, in a neo-institutional perspective, to an isomorphism which encourages rationalisations of university systems based on similar models.

C. Musselin (Musselin 2001; Musselin, Ferlie et al. 2008) notes that, even in France, a country in which the universities are at once closely linked to the State and have few ties with industry, there has been a gradual evolution away from a centralised, egalitarian, faculty-based university system. The system is beginning to be organised around establishments with their own clearly defined strategies, while still accommodating state tutelage (Frémont 2004) (Revue-Esprit 2007). A system, in other words, which tends towards a higher degree of territorial differentiation and interconnection with territorial authorities and the business world (Cytermann 2007).

Evolutions of this kind do not occur by themselves. On the one hand, they are not necessarily underpinned by unified doctrines (Musselin, Ferlie et al., 2008) and government-coordinated strategies. On the other, such evolutions are hindered by the existence of deeply entrenched organisational mechanisms and work habits (Kletz and Pallez 2002). Whatever the difficulties involved, one of the aims of these policies is to transform the universities into “entrepreneurial” establishments (Harding, Scott et al. 2007)

In many countries we now observe a process of institutional reorganisation whose purpose is to implement Triple Helix mechanisms. This situation has as yet received little attention. But it does invite scholars to examine more closely just what is happening within these new structures, to understand how they facilitate the development of links between the three spheres.

2. The French case, methodology of its study

Between 2004 and 2006, French government legislation successively created the “Pôles de compétitivité” (“competitiveness clusters”); the “Pôles de Recherche et d’Enseignement Supérieur” (“PRES” or “Research and Higher Education Centres”); and the “Réseaux Thématiques de Recherche Avancée” (RTRA or “Advanced Research Theme Networks”).

The objectives assigned to these various bodies are as follows:

- The purpose of competitiveness clusters, officially recognised and supported by the State is to constitute geographical concentrations of actors from the spheres of business, research and education and to encourage them, amongst other things, to develop collaborative R&D projects (Weil and FenChong 2008). This approach is financially supported by public funds (€1.5 billion between 2005 and 2008). There are currently seventy-one government-sanctioned clusters in France.
- Research and Higher Education Centres (PRES) are charged with encouraging universities to cooperate with one another and with France’s *grandes écoles* within a single geographical territory. Subsidised by the French government, the approach used by the Centres is based on a trans-disciplinary philosophy. In 2007, there were nine such Centres, and fifteen in 2009.
- Thirteen Advanced Thematic Research Networks (RTRA) were opened in 2006 with the aim of creating, around a hardcore of geographically concentrated research centres, a critical mass of researchers of the highest

level working together. Based on a "foundation of scientific cooperation" they receive public subsidies but are also open to private investment.

This blossoming of new institutions is based on an apparently simple observation: France's power to foster the economic dynamic by means of innovation pre-supposes cooperation between actors who were both too fragmented and too isolated. The various bodies mentioned above aim to federate these actors, while making them more visible. Even if the PRES and the RTRA have objectives within the academic system, it was expected from the outset that they would work, at least to some degree, in conjunction with competitiveness clusters.

In terms of their underlying principles, these institutions seem to contribute to the construction of an integrated system operating under the aegis of the State. But how are the institutions and policies mentioned above articulated in reality?

Our survey of the nature and effects of these articulations was carried out at the request of the DIACT ("Délégation Interministérielle à l'Aménagement et la Compétitivité des Territoires", or "French Inter-Ministerial Delegation for Territorial Development and Competitiveness") between late 2007 and spring 2008 (Lefebvre and Pallez 2008) (Fixari, Lefebvre et al. 2008). The survey focused on four regions. In each case, documents were consulted and interviews carried out with a view to studying what we have termed territorial "sub-systems" built around one (or two) competitiveness clusters and made up of various components of the higher education and research system linked to the clusters either geographically (the PRES) or in terms of research themes (the RTRAs).

We interviewed the heads of competitiveness clusters, PRES, RTRA, to examine with them the way in which they coordinate and envisage their future relations. We also consulted the government representatives responsible for developing and piloting the approaches, as well as with the territorial collectivities concerned, notably the Regions. Lastly, we interviewed a number of ground workers, or, in other words, businesses and research centres.

3. Empirical results

The variety of regional configurations

One of the most interesting results to emerge from the study is that there exists a wide variety of regional configurations, a fact which precludes from the outset any generalising explanation of the effects of the new policies. This observation[2] may, at first sight, seem paradoxical in a country like France, still considered as highly centralised, especially in that its university system continues to be shot through with egalitarianism.

[2] Also made by other research teams who have worked in parallel with these institutions (Aust, J., C. Crespy, et al. (2008). Rapprocher, intégrer, différencier. Éléments sur la mise en place des pôles de recherche et d'enseignement supérieur, Rapport pour la DIACT.

This variety reflects the flexible nature of the new institutions which, influenced by the initiatives of local actors, are sometimes obliged to adapt to local situations inherited from the past and to the contrasting characteristics of the industrial and scientific sectors with which they become involved, thus moving away from their original remits.

One important source of diversity derives from the fact that the French regions are not equal in terms of economic and academic development. The competitiveness clusters themselves have been divided into three categories (world clusters; clusters with global ambitions; and national clusters) reflecting this unequal state of affairs. The PRES and the RTRA were not set up in the same way across France: only a handful of clusters are linked to both a PRES and an RTRA.

We have provided schematic outlines of three possible configurations below:

- A *basic schema* (corresponding to the "largest" world-class clusters or clusters with global ambitions) with an RTRA "attached" to a competitiveness cluster, and a regional PRES.
- A *simplified schema* in which the region contains one or more clusters but no corresponding RTRAs and, sometimes, no PRES.
- *The Capital Region schema* which contains several clusters each possessing an interface with one or more RTRAs and one or more PRES.

Competitiveness clusters promoting industry-research collaborations

Some competitiveness clusters are structurally better placed than others to drive industry-research collaborations in their field of specialisation. Although the effects of the voluntarism and ability of cluster directors should not be discounted, various factors observed in the empirical survey seem *a priori* to encourage such collaborations:

- Sectors of activity in which the gap between research and innovation is easily bridged, and the division of labour between research and industry is well defined and indispensable.
- Situations in which collaborative projects involving industry and public research centres are a normal occurrence.
- A thematic and geographical parameter at once homogeneous and easy to manage giving the cluster a strong identity, which is, at the same time, flexible enough to accommodate new transversal collaborations.
- Actors from industry acting as drivers of projects.

These factors make it possible for a cluster to develop a tried and trusted model of innovation. This is the case of the System@tic cluster located on the Saclay Plateau, south of Paris, an area in which a number of prestigious public research centres are based. System@tic includes a number of major industrial firms, it specialises in complex systems, especially software, and thus encompasses a varied range of industrial enterprises. In other cases, however, research areas may be more fragmented or composite (Medicen, Aerospace Valley), and collaborations with local research centres less frequent (Lyon Biopôle).

In fact these clusters have different types of relations with the other two kinds of entity (RTRA, PRES).

Networks for Advanced Thematic Research (RTRAs): academic focus and relations with industry

Although the RTRAs were originally encouraged to monitor the transfer of scientific advances in the form of innovation their primary mission is informed by the concept of academic excellence. It is therefore unsurprising that there are two kinds of RTRA, the first with essentially academic objectives and the second more dedicated to industrial innovation.

The nature both of the scientific themes selected by the Networks and the objectives assigned to them go some way in explaining the fact that some of them entertain a relatively small number of links with industry. The primary objective of RTRAs such as the "Triangle de la Physique", whose personnel is made up of high level theoretical physicists, is to encourage and enable its research staff to work together on frontline scientific projects. Consequently, even though the possibility of committing to joint projects with private sector companies is not rejected out of hand, such projects are not, in the short-term at least, a priority. On the other hand, RTRAs like "Digitéo", whose areas of research are directly correlated with those of the System@tic cluster, pursue objectives answering to the demands of scientific excellence in addition to developing joint projects with industrial firms associated with the cluster.

But another important empirical result of our study reveals that, under no circumstances should proximity to industry (in bilateral relations) and proximity to competitiveness clusters (in collaborative relation involving a number of different companies) be confused. Some RTRAs work closely with private sector enterprises while simultaneously declining to work with clusters.

Thus, the primary, and original, objective of the RTRA "Pierre-Gilles de Gennes Life Sciences Foundation" is, within the framework of tight-knit public-private partnerships, to pursue fundamental research at the highest level with a view to developing parameter-breaking industrial innovations. Due to its approach to research-industry relations, the Foundation has no links with the "Medicen" cluster, even though the cluster focuses on the same areas.

All this can be explained by the collaborative nature of the work in which clusters are involved: it is, in itself, incompatible with the notion of industrial secrecy, and it tends to produce relatively consensual, rather than cutting edge, research. By contrast, one of the major objectives of the RTRAs is to develop projects that are ground-breaking, a situation that tends to favour bilateral collaborations with private sector companies.

Research and Higher Education Centres (PRES): lack of legitimacy, loose ties with Competitiveness Clusters

In terms of core university activities – pure research and teaching – the PRES are currently taking a prudent position, with each individual Centre following its own specific policy. Interestingly, most of these institutions suffer from a legitimacy deficit which can be explained in reference to two main factors.

The first is the absence of national research bodies, such as the CNRS, involved in the governance of the PRES. This has a substantial impact on the PRES activities since most university research centres are mixed, with major research bodies playing the role of essential stakeholders. Moreover, the fact that these major institutions dispose of their own tools for promoting research further complicates the issue of interfacing with the PRES.

The second problem of legitimacy faced by the PRES is linked to the fact that certain tasks have to be shared with RTRAs operating in the same geographical territory. In certain cases, the PRES possess a very wide geographical and institutional parameter, encompassing every higher education and research establishment in their region. RTRAs, on the other hand, focus on specific research themes. Furthermore, the activities of the two types of institution tend to intersect rather than encompass each other. In such cases, interfaces can be conflictual and frequently difficult to organise.

Concerning relations between the PRES and Competitiveness Clusters, they are almost non-existent. This is particularly evident in the field of education, a sphere in which the PRES should, logically, enjoy a greater degree of legitimacy.

The absence of links between PRES and Competitiveness Clusters can largely be explained by the fact that the latter are primarily encouraged to initiate and carry out R&D projects, with the result that the development of training programmes has, to some degree, fallen into abeyance. Another reason is that the universities themselves find it very hard to organise, unify and clarify their educational offer. This offer is most frequently elaborated by teacher-researchers by means of a bottom-up process, and lead teams have little influence over its development. For their part, the PRES find it hard to structure and rationalise their offer and combine it with demands for skills and competencies expressed by the Clusters and the industrial companies making up their membership.[3]

4. Regulating relations: state involvement or a spontaneous process between actors?

We have outlined a complex, rapidly changing landscape, with a “systemic” nature, involving a plethora of actors and institutions. In consideration not only of the already existing positive dynamic but also of the personal commitment of certain actors involved in the institutions under discussion, it would, therefore, seem vain to bring

[3] In passing, it should be pointed out that the relevance of this last objective, based on a simplistic and questionable models which involve striking a balance between an “academic” education offer and the skills required by industry, is highly debatable.

the global institutional architecture into question. Nevertheless, a number of clarifications and modifications could improve the efficiency of the overall system.

A permanent juxtaposition of different institutions or a transitory complexity?

Taken separately these institutional models are often adjudged “intelligent”. But they were designed relatively independently of each other. The interfaces between the models are neither natural, nor specifically defined by the legal texts underpinning their creation. Furthermore, the new institutions are operating in a sphere that is already saturated (numerous promotional bodies, public and private foundations, research clusters and scientific networks already existed before they were set up).

As a result, there is a universally shared view that the overall institutional landscape is unnecessarily complex, even if the most dynamic actors have managed to seize the opportunities created by the system to the benefit of their projects. That said, however, in view of the timescales usually associated with reforms of this type, it is reasonable to assume that we are currently in a transitory phase which only partially prefigures the future.

There are two schools of thought about future developments. Some observers take the view that, even if there was no coherent overall plan at the outset, the jigsaw will gradually fall into place. The system will undergo gradual, contingent adjustments. Others believe that a radical simplification of the system is required.

Nevertheless, a number of fundamental questions need to be asked: How efficient is the system currently being constructed? Does its architecture need to be modified?

The answers to these questions are to be sought in an examination of three issues:

- Should relations between research and industry necessarily depend on relations between Competitiveness Clusters and RTRAs?
- How can the position of the PRES be strengthened and the division of labour between those Centres and the RTRAs be clarified?
- Regions, cities and the State: Is an integrated vision called for?

Should relations between research and industry depend on links between Competitiveness Clusters and RTRAs?

The cases studied reveal that there are a number of different types of relations between RTRAs and Competitiveness Clusters:

- in certain cases, RTRAs play an essential role vis-à-vis Competitiveness Clusters, promoting regular exchanges concerning industrial and research strategies thereby creating valuable synergies, and providing a shop window for scientific excellence thereby attracting foreign investors looking to set up in France.
- in other cases, a less tight-knit relationship, consisting solely in an exchange of information, safeguards the independence of the two institutions while at the

same time giving industrial and academic partners an insight into each other's *modus operandi*.

- lastly, some RTRAs may choose to ignore the Clusters, either because academic objectives predominate or because they prefer to build up bilateral relations with industrial companies which lead to more radical innovations than those generated by joint projects developed and brought to fruition within the framework of Competitiveness Clusters.

RTRAs thus take a wide variety of stances to their relations with Competitiveness Clusters, which is in itself symptomatic of the possible diversity of relations between research and industry depending on areas of interest, disciplines, industrial sectors and choices concerning scientific strategy and philosophy of action.

How can the relations between PRES and RTRAs be clarified?

The PRES still seem to be in a process of development and sometimes have difficulty in asserting their role vis-à-vis other institutions. In order to strengthen that role, their relations with RTRAs should be clarified and their institutional position reinforced.

Currently, how best to manage the interfaces between PRES and RTRA when such institutions co-exist on the same territory is an issue of vital importance. Fundamentally, difficulties in this area derive from doctrinal choices which were developed by two different entities within the public administration.

We suggest two ideal models describing how the two institutions could be articulated, the first characterised by the inclusion, or quasi-inclusion of one or more RTRAs in the PRES concerned; the second characterised by a simple intersection of the two institutions. The first situation can lead to a "delegation model" in which the RTRA acts as a leading brand of the PRES in a particular area of research, fulfilling delegated representative tasks and cooperative missions involving actors such as Competitiveness Clusters.

In the second case, the "intersection model" promotes the idea of sharing tasks by means of informal but explicit agreements involving the two kinds of institution.

Regions, cities: should strategies be autonomous insofar as national policies are concerned?

In many cases, the Regions and, to a lesser degree, the major metropolises had already decided to try and provide a structure for the industrial and academic landscape, sometimes even before Competitiveness Clusters were introduced. They did so by playing a facilitating role when new structures were being set up, encouraging the creation of networks, and providing financial aid.

Since 2005, the territorial collectivities have supported Competitiveness Clusters, largely by financing their day-to-day running and defining, in some cases, priorities in the field of economic development. The collectivities also invest in certain areas of research and, where possible, "sub-contract" them to the PRES and the RTRA.

Even if, in general, the territorial collectivities do not impose pre-conceived schemas, the scientific-industrial structure they help encourage is not necessarily entirely coherent with priorities, officially sanctioned by the State, of the clusters, the PRES and the RTRAs. This begs the question of how such policies are to be coordinated. Indeed, the very large number of public institutions which, at various territorial levels, orient and support research and innovation is often cited as a source of inefficiency.

If, from our point of view, there is no need to bring the autonomy of these various actors into question, it is nevertheless worth underlining that there is currently no systematic procedure that takes into account the integrated effects of the various policies examined above, policies which often impact on identical actors in a given geographical area. Currently, evaluations tend to focus on one type of institution at a time. A more effective approach would, perhaps, be to introduce regular territory-based evaluations which provide a detailed examination of the effects of the coexistence of these different institutions, isolating the shortcomings and contradictions as well as the complementarities and synergies characterising the way in which they are coordinated.

5. Conclusion - Discussion

This analysis of French policy highlight a number of theoretical questions concerning the models mentioned at the beginning of the article. At this juncture, we would like to address three points:

- The three entities identified in the triple helix model are too wide-ranging and neglect the role played by small groups of influential actors.
- Links between science and innovation, and university and industry can take very different forms, forms that must be carefully defined and closely analysed; in this regard, the pertinent level of analysis is the cluster rather than the region**.**
- New relations between State, university and industry are accompanied by a number of evolutions within the three types of institutions discussed

State, university, business: categories too vague, too much emphasis on institutions

The triple helix model fail to take into account the sub-ensembles constituting the three categories on which they are based: business, the academic world, the State. This last term, for example, covers the State and the regional, departmental and municipal authorities, whose various components have sometimes divergent approaches.

Competitiveness clusters, PRES, RTRA put in fact emphasis on quite different points:

- Competitiveness Clusters: emphasis on encouraging the development of industrial research programmes in tandem with publicly funded research bodies.
- PRES: emphasis on the Academic Ranking of World Universities (visibility-attractiveness), and management efficiency
- RTRA: emphasis on excellence in the field of research and on encouraging links with innovation.

Within the Regions, internal competition between the territorial collectivities is also a factor. Lastly, as we have seen above, the State and the territorial collectivities elaborate autonomous policies.

Not only are the analytical tools insufficiently well defined, but these essentially institution-based models are lacking an important element: the fundamental role played by "modernising" actors who collectively condition and orientate the public policies under discussion. Operating within networks, these small groups of influential actors have a considerable impact on the institutions concerned, be they active in the academic, industrial or governmental spheres.

Interactions between actors must be better defined

Aspirations concerning the intensity of links between the universities and industry vary widely in both the academic and industrial spheres. Furthermore, relations between the two parties cannot be said to reflect a linear model: science/universities → innovation/industry is too simplistic a formula. As we have seen within the RTRAs, some researchers make a strong distinction between science and innovation, while others believe that there is an evident continuity between them. Likewise, industry's expectations regarding the universities vary widely:

- in some sectors of the economy, relations between industry and research are minimal (for example, highly fragmented sectors such as mechanics in which R&D plays a marginal role).
- some companies are happy to enter into a bilateral relationship with research centres but not with Competitiveness Clusters; others are willing to work with both kinds of institution.

A profound transformation in modes of government action

One of the most important factors highlighted by the Triple Helix theory is that the construction of interactions between State, industry and university is necessarily accompanied by a profound transformation of each one of those entities taken separately. We will illustrate this essential point by reviewing current evolutions in academe and the transformation of approaches taken by the State and its agencies.

The French academic world is undergoing a large number of changes, of which the introduction of the concept of the "entrepreneurial university" is only one (Paradeise, Reale et al. 2009). The sharing of tasks between universities, *grandes écoles*, and major research bodies, the status of teacher-researchers, and approaches to evaluation and financing are all being reformed. At the same time, the development of autonomy vis-à-vis the State continues as ties with other entities on the regional level become closer. But it should be noted that these changes are, like the policies governing Clusters, originated essentially at the national level.

However, for the State, the method used consists in palliating its traditionally dominant position by replacing top down with bottom up approaches. These policies are increasingly administered in partnership with the organisations concerned

(universities or businesses) and encompass consultations on future orientations, joint-definitions of objectives, and even a certain leeway in some fields of activity in terms of defining the criteria on which they will be evaluated by the State (for example, specific indicators in the performance contracts of French Competitiveness Clusters). This does not preclude the State and its agencies from defining general frameworks by means of tenders and official recognition. But neither the instruments used nor the institution vision applied are definitively fixed – formal evaluations are informed by a desire to experiment and learn.

The overall impression is of an attempt by the State to shake up actors regarded as having been passive for too long by introducing new structures and hoping that the most dynamic actors will exploit the opportunities they bring, with adjustments being made at an unspecified later date according to a twin process of "natural selection" and gradual evolution in a transitory phase of creative chaos.

This approach pre-supposes that the State, both on the national and regional levels, has a learning capacity equal to the task, which is by no means guaranteed. However, in the light of our empirical study, the approach nevertheless seems to be adequate in terms of constructing the kind of complex and moving interactions between different actors required to make innovation policies successful.

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